

REMARKS

The Examiner has rejected claims 1-6, 8-15, 17-20, 22, 24-26, 28-41, 43-50, 52-55, 57, 59-61, 63-74, and 75-82 under 35 U.S.C. § 103(a) as being unpatentable over Chung et al. (U.S. Patent Publication 2003/0203616) in view of Lai et al. (U.S. Patent 6,939,804). In addition, claims 16 and 51 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Chung et al. and Lai et al. in view of Elers et al. (U.S. Patent Publication 2003/0203616). The following remarks are respectfully submitted.

Independent claims 1 and 38 recite a method of depositing a metal layer on a substrate (claim 1) or a method of depositing a W layer on a substrate (claim 38) that combines a number of features including, among them, performing a plurality of deposition cycles to deposit a metal layer (claim 1) or a W layer (claim 38) with a desired total thickness, each deposition cycle comprising: first, exposing the substrate to a metal-carbonyl precursor gas (claim 1) or a $W(CO)_6$ precursor gas (claim 38) to deposit a thickness between greater than 5 angstrom (A) and about 60 angstrom (A) of the metal layer (claim 1) or the W layer (claim 38) on the substrate, wherein the substrate is maintained at a substrate temperature that results in thermal decomposition of the metal-carbonyl precursor gas (claim 1) or the $W(CO)_6$ precursor gas (claim 38), and second, exposing the metal layer (claim 1) or the W layer (claim 38) to a reducing gas.

With respect to the rejection under § 103(a) over Chung et al. in view of Lai et al., Applicant respectfully traverses. In the Response to Arguments in the Final Office Action, the Examiner states that “variable layer thickness per cycle is shown to be achieved by routine experimentation by Chung et al., as Chung et al. teaches that during a cyclical deposition process (which in this case includes thermally decomposing the tungsten precursor as taught by Lai et al. for the first layer), the deposition rate of the metal layer varies as a function of the metal precursor (column 10, lines 9-25), showing that it would be obvious to modify this variable by routine experimentation”.

The Applicant respectfully points out that this conclusion is flawed because Chung et al. describes tungsten deposition at low substrate temperature in a cyclical deposition process (atomic layer deposition (ALD)) where a maximum of about a monolayer of a tungsten carbonyl compound is adsorbed on the substrate in each deposition cycle. This substrate temperature limits the thickness of the tungsten carbonyl compound adsorbed on the substrate in each deposition cycle to a maximum of about 1 angstrom (paragraph [0046] in Chung et al.) because the substrate temperature used by Chung et al. is below a temperature where

thermal decomposition of the tungsten precursor with high deposition rates occurs in a chemical vapor deposition (CVD) process as described by Lai et al. ALD and CVD processes are fundamentally different deposition processes that require different substrate temperatures. Therefore, using the higher substrate temperatures in CVD process described by Lai et al. would prevent the use of the cyclical deposition technique described by Chung et al. where a maximum of about a monolayer of a tungsten carbonyl compound is adsorbed on the substrate in each deposition cycle. There is no *prima facie* case of obviousness and Applicant therefore respectfully requests withdrawal of the rejections under § 103(a) over Chung et al. in view of Lai et al.

The remaining rejections are under § 103(a) over Chung et al. and Lai et al. in view of Elers et al. The Examiner relies on Elers et al. to teach a reducing gas comprising NH₃. Applicant asserts that Elers et al. fails to cure the deficiencies of Chung et al. and Lai et al. described above. There is no *prima facie* case of obviousness and Applicant therefore respectfully requests withdrawal of the rejections under § 103(a) over Chung et al. and Lai et al. in view of Elers et al.

In view of the foregoing, therefore, the Applicant respectfully requests reconsideration and allowance of the present application. If the Examiner believes any detailed language of the claims requires further discussion, the Examiner is respectfully asked to telephone the undersigned agent so the matter may be promptly solved. The Examiner's prompt attention to this matter is appreciated.

Applicant is of the opinion that a one-month extension of time is due as a result of this filing. If there are any other fees required from this submission that not otherwise accounted for, please charge any fee such associated with the submission of this paper to Deposit Account Number 503451.

Respectfully submitted,
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